INTRODUCTION TO SOCIOLOGY. III.[1]

PART III. GENERAL STRUCTURE OF SOCIETIES.

CHAPTER IV. THE SOCIAL LIMITS.

SECTION V. BIOLOGICAL LIMITS.—*Continued.*

HOWEVER, protoplasm itself has a structure. There is an organism having the structure of an amœba, without any membrane other than its geometrical limit, and without a nucleus, but it has the essential elements of a nucleus distributed throughout the protoplasm. After the central mass is separated from the periphery with which it is blended, the organism becomes a cell. Every organism is a cell or a combination of cells. The *ensemble* of the forms of the whole organism is then the product or general total of all the aggregated cells. Thus the forms of elementary organisms are: (1) forms without a membrane and without a nucleus; (2) forms with a nucleus and without a membrane; (3) forms with a nucleus and a membrane. With each step in the progress of organization, the equilibration to the environment becomes more perfect; that is to say, the organism maintains itself by adaptations to more numerous and more special conditions. But, as among plants, this structure, differentiated into a nucleus and a membrane, though it suffices for the unfolding of its life, and for resistance, especially in a passive way, to the environment, is not adequate for more complex, precise, and especially active adaptations. This unicellular state forms the basis of the multicellular; that is to say, for an association of simple homogeneous cells. In the multicellular organisms there is a differentiation into an external and an internal layer. In plants this external and protecting layer is the *epidermis*, the inner and assimilating layer being the *parenchyma;* in the animals, the external sensitive and protecting surface is the *ectoderm*, and the interior and assimilating membrane, or *endoderm*, forms the boundary of the digestive cavity, which does

[1] Translated by Eben Mumford.

not exist in plants. In the higher protozoa the pseudopods of the amœba are represented by cilia, and the ectoderm of the lower invertebrates is generally ciliated in order to assist locomotion, as is the endoderm to promote the movement of food toward the digestive cavity. In the course of evolution the cilia of the ectoderm and of the endoderm have disappeared, and have been replaced by muscular movements.

What is it, then, from the point of view of limits, that distinguishes the superior from the inferior forms? The distinction consists in the increasing differentiation of functions and organs in the whole structure. The result is that the motility of animals augments with increasing complexity and co-ordination of structure. The superior animals move more rapidly and in more directions; they do not have absolutely fixed limits; they search for their prey and avoid their enemies. This difference in motor capacity is related to the difference in the development of their digestive, vascular, and respiratory organs, but principally to their contractile structure, that is to say, their muscular system.

From the point of view of general philosophy, every structural differentiation is the morphological aspect of a differentiation in the internal and external movement, which, constituting the life and equilibration of the structures may fall back to the most general laws of mechanics, although biology supposes special phenomena, which, like those of sociology, call for a particular interpretation and philosophy.

The muscular system is the fundamental structure making possible the expansions and contractions of organisms—in a word, the performance of the movements appropriate to the *milieu*. But without the nervous system the muscles themselves would remain passive; the real generator of motility then, is the nervous system; it transmits the excitations from within and from without, and co-ordinates the movements of more and more special adaptations; it maintains the general equilibrium in the midst of a more and more intense instability; it is the regulator *par excellence* of organic structures. It is, then, only in appearance that organic bodies seem indeterminate in their

structures and movements ; the truth is that, as one ascends the hierarchy of organisms, the more considerable variations are limited as much within as without by the more special and energetic agents of equilibration. The organs of life always determine and limit the structure and life.

However, at the basis of all organic life, under the names of contractility, irritability, sensibility, etc., we will always find motion; and so again, from the point of view of general philosophy, life can be expressed in terms of motion and in the laws of mechanics, themselves capable of being expressed mathematically.

It is only in appearance that the inferior social aggregates seem to have more fixed limits. In reality their movements are few and simple; they are determined strictly by the simple general conditions of their external structure in relation to the most simple and general conditions of the environment, whether they are exclusively physical or both physical and social. A bad harvest, poor fishing, the disappearance of game, sometimes involve migrations, but more often still a partial or even total extinction of the horde, unless the aggregate is capable of undergoing the variations necessary to adapt itself to the new conditions or to modify them. In the latter case there will be formed a favorable variation in structure—an increase of activity or an extension of the agricultural, hunting, or fishing territory; or, indeed, certain classes of individuals will devote themselves to a new kind of work, while the others will continue to drag along in the old occupations. Often the increase will be, as in inorganic matter, by external growth, by addition; ordinarily, however, there will be an incorporation, an assimilation giving place to an elaboration and to an internal development.

It is equally necessary to note that at the origin the external membrane is not very distinct from the *milieu;* it has not become strong as in the more developed stages. But that which characterizes the superior animals is that the internal organization gets the upper hand, where, for example, the shell, as in the carapace of the fish *ganoideus* (sturgeon), gives place to an internal structure, frame, vertebral column, and organs. It is in the

interior of the body that the conditions of stability are formed. Each organ becomes more and more special; each one is limited by its neighbors, and all by the whole structure. The covering ceases to be a defensive barrier or an offensive weapon; it finally becomes one of the most delicate organs of sensibility and of relationship; it accommodates itself everywhere to movements and impressions.

An analogous development may be seen taking place in social structures. That which was a barrier is transformed into means of communication, such as rivers, seas, and oceans. The boundaries, at first apparently little fixed, but in reality very rigid, especially in a general way, become more and more elastic; openings are made; better communications are set up; a general level is established like that between communicating vessels; new relations increase; societies of societies are formed with a new internal structure in relation to a new environment, until in a future of which it is possible to catch a glimpse there may be formed one vast society including all the various particular societies in one supreme internal co-ordination—the largest structure and the most complex equilibration which it is possible for the imagination to conceive. Then the social world may find its equilibration and limits; not only in its internal organization, but also in the limits themselves of the earth and its environment.

This progress takes place in proportion to the development and the differentiation of social functions and of their progressive co-ordination in more developed regulating centers. The problem of boundaries and limits is, then, connected with the development, the differentiation, co-ordination, of economic, genetic, artistic, scientific, moral, and juridic institutions; the political structure, by which the collective will of society is directed through a more or less methodical organization, is the crowning of all the others. When the fundamental institutions are narrow, simple, and authoritative, the boundaries between societies are high, general, and inflexible. So religions are more exclusive than metaphysics, the latter than science and positive morality. Societies protect themselves by offensive and defensive

arms, by natural and artificial barriers, by protection and by free competition, having to protect themselves by the excellence of their external and international organization.

Before studying the philosophy of the social boundaries of the future, and even that of the limitations of modern states, which are very complex structures, it is necessary to take up the philosophy of the natural limitation and equilibration of things and organisms in general; then those of primitive societies, peaceful and warlike. Finally it is necessary to investigate this same constant limitation in the economic field and in all the social functions and organs, including the juridical and political. Here again, as in my former observations, we shall see more and more the social contractual forms, including equally the political contractual forms, separating themselves from the more ancient and crude forms, and limiting the reciprocal relations of the social units and aggregates as well as the societies between them, from the most simple industrial association up to that large universal society of which the relations, intertwined more and more among the various parts, formerly separated by insuperable boundaries, prepare the way for a natural formation.

This constant equilibration which results between the internal structure in relation to the environment seems, in a way, most admirable in the statics of the organisms most developed of all, that is, those constituting the human species, and especially in the psychical organization of the latter. The limits of organic variations become more extended there, all remaining in close dependence upon the whole structure. After this, there will remain for us to observe how masses, both inorganic and organic, are distributed naturally in or on the earth, as masses, in order to be prepared to enter, in a methodical way, upon the study of sociological limits and boundaries which form a special and more complex case of those already given.

SECTION VI. ANTHROPOLOGICAL LIMITS.

The human species belongs to the class of superior vertebrates. The skeleton determines the general form of our bodies. It serves as a point of attachment for the muscles and determines the visceral cavities. We have explained how the struc-

ture of the *ensemble* of organic bodies, including the human body, depends first of all upon their internal constitution and organization. The latter, from the point of view of accommodation to the environment, acquires an increasing importance. But whatever may be the stage of perfection of the internal organization and activity, the structure and function of the human species present constant and necessary relations of equilibration existing between the external and internal environment. Let us see how this equilibrium of movement is produced. When the muscles are contracted they move the bones to which they are attached. The muscles represent the organs of movement—the motor forces. The bones serve as levers. The point of support is furnished by the articulation. The resistance is the bone itself. The working of the bones in the *ensemble* of our structure serves to maintain the equilibrium, to overcome the great resistances, or to impart more or less extended movements, as, for example, the equilibrium given the head by the atlanto-occipitalis articulation. There is a center of gravity of the head. The weight of the latter acts in the sense of a vertical line drawn from the center of gravity. It is the resistance. The point of support is the articulation. The muscles of the neck represent the power. When there is action in order to overcome resistances, the resistance is between the power and the point of support; for example, when one places the total weight of the body on the tiptoes. When one executes movements more or less extended, the power is found between the point of support and the resistance. In all these cases there is no movement executed without a corresponding equilibrium. Photography, at least instantaneous, provides an excellent process for noting the different modes of locomotion, as walking, running, jumping, and flying. In all these movements there is always an equilibrium of the internal structure, that is to say, of all parts of the organism among themselves, and besides an equilibrium of the *ensemble* with the environment. The latter ought never to be lost from view. It is an essential element of the modifications of every equilibrium and its support. When one makes a false movement, the failure is accompanied at the

same time by a new internal equilibration and an application of the laws of general equilibrium as over against the environment. In fact, we maintain an upright position on the earth as a result of an equilibration with the atmospheric environment and the laws of gravity. The human species can be considered as unique because of common anatomical and psychical characters which exist among its numerous varieties, and because of fertile crossings between the most extreme races, and, as distinct from other organic beings, by special characters which differentiate it in a considerable manner. All the variations of structure of the human species are, in reality, narrowly limited. They are themselves the result of internal and external equilibrations, that is to say, of special adaptations of which certain ones are of social origin.

1. *The weight of the human body.*— The variations of the weight of the body are determined by four special conditions: the physical environment, race, temperament, and food. Obesity is everywhere exceptional. In all races and in all environments it depends chiefly upon the hygienic conditions, upon inactivity, and upon excessive or gross and insufficient food. The yellow, white, and black races do not deviate from the average of the human species, except under particular influences. The Arab, gaunt in the desert, becomes corpulent in cities, especially among the idle and parasitic classes. The average weight of the human adult body seems to vary from sixty-six to forty-two kilograms, depending upon the populations.

TABLE OF VARIATIONS IN THE WEIGHT OF THE HUMAN BODY.

300	Belgians (Quetelet)	66.2 kg.
12,740	Bavarians (Bernstein)	65.5
400	French, light infantry (Bernard)	64.9
617	English (A. L. Thompson)	64.8
150	New Zealanders	63.9
34	Nicobarese (Novarra)	62.8
278	Magyars (Bernstein)	60.7
24	Slavs	59.2
356	Roumanians	58.4
50	Hindoos, superior caste (Shortt)	53.2
60	natives of Caucasus	50.0
5	Hindoos, inferior caste	48.7
50	Nilghars, inferior tribes	44.6
39	individuals, inferior tribes of Coromandel	42.7

Quetelet has studied the weight of the human body at different ages from the point of view of his theory of averages. At the same age the male is heavier than the female, except about the age of twelve, when the weight is the same. Woman reaches the maximum of her weight later than man. The weight is greater among boys and girls who do not work in factories. Quetelet takes the average man as the type of both stature and weight. These results hold only in determined aggregates, or between analogous aggregates.

2. *The human stature.*—The human stature is limited in its variations by the environment and by hereditary influence. Heredity tends to maintain its forms or characters, if the conditions of the physical or social environment are not modified. Among the causes of variation, one may note residence in the town or the country, professions, food, climate, sickness. Galton has observed the stature and weight of children attending the public schools in England. Fifty were reared in London, 296 in the country. The stature of the latter exceeded that of the former by 3 centimeters, and the weight of the country children exceeded that of the city children by 3 kilograms.[1]

If weight and size in comparative anatomy have only a secondary value, if the largest animals approach the smallest in adjacent species, it is not entirely true from the point of view of the sociological characters of the human species. The weight and stature of man have the effect of indexes in the social realm. Man approaches the anthropoids in this respect. The chimpanzee is about 1.30 meter; the orangs, depending upon the species, range from 1 to 1.60 m.; the gorilla, from 1.40 to 1.75 m. The human adult stature varies from 1 to 2 m. In France, the average adult stature is 1.65 m. From the table given by Topinard,[2] it is shown that the highest averages belong to the Tchuel-

[1] Concerning the influence of food, DARWIN (*The Descent of Man*, p. 31) says: "When we compare the differences in stature between the Polynesian chiefs and the lower orders within the same islands, or between the inhabitants of the fertile volcanic and low barren coral islands of the same ocean, or again between the Fuegians on the eastern and western shores of their country, where the means of subsistence are very different, it is scarcely possible to avoid the conclusion that better food and greater comfort do influence stature."

[2] *Anthropology*, pp. 253 ff.

ches of Patagonia and to the Polynesians, and the smallest to the Bushmen.

One ought to compare only individuals of the same sex, measuring only those who have reached the age of maturity, a period varying from the age of twenty-three to thirty-three, according to race. In general the most inferior races attain full growth later than the others, and show a smaller difference between the sexes.

300	Belgians,	age	19,	measured	by	Quetelet	1.66 m.
300	"	"	25,	"	"	"	1.67
300	"	"	30,	"	"	"	1.68

The variations of structure in the same group are smaller in proportion as the race is more homogeneous. Here again fusion with civilization reduces the variation. Africa shows the strongest divergence, especially among the Kaffirs and Bushmen.

The statistics on the influence of the environment furnish important information. In Belgium, for the militia and volunteers whose stature was taken for the ages of 19 to 20 in 1888, we have the following tables:

Of 5,426,	854	were	from	1.55 m. to 1.60 m., or	15.92 per cent.
	1,632	"	"	1.60 m. to 1.65 m., or	30.08 "
	1,970	"	"	1.65 m. to 1.70 m., or	36.31 "
	772	"	"	1.70 m. to 1.75 m., or	14.23 "
	150	"	"	1.75 m. to 1.80 m., or	2.76 "
	33	"	"	1.80 m. to 1.85 m., or	0.61 "
	5	"	"	1.85 m. to 1.90 m., or	0.90 "
					100.00 per cent.

The following are the measurements of 9,067 men of the militia and volunteers over twenty years of age, taken in 1888:

1,050	were	from	1.55 m. to 1.60 m., or	12.37 per cent.
2,229	"	"	1.60 m. to 1.65 m., or	26.25 "
2,625	"	"	1.65 m. to 1.70 m., or	30.92 "
1,764	"	"	1.70 m. to 1.75 m., or	20.78 "
644	"	"	1.75 m. to 1.80 m., or	7.59 "
152	"	"	1.80 m. to 1.85 m., or	1.79 "
25	"	"	1.85 m. to 1.90 m., or	0.29 "
1	"	"	more than 1.90 m., or	0.01 "
				100.00 per cent.

The proportion was:

1890.	1895.	1899.	1900.
12.88	14.91	13.19	13.17
26.03	29.21	27.15	29.52
34.01	32.50	33.85	32.75
20.14	17.76	19.36	18.11
5.91	4.74	5.45	5.43
0.95	0.80	0.90	0.93
0.07	0.08	0.09	0.09
0.01	0.00	0.00	0.00

According to Quetelet[1] the number of the militia coming under this relation of stature in Belgium from 1842 to 1850 was 322,756, the number of whom the stature was taken being 307,462.

51,105 were 1.56 m. and below, or 16.62 per cent.
158,796 " 1.561 m. to 1.669 m. or 51.64 per cent.
94,938 " 1.67 m. to 1.799 m. or 30.88 per cent.
2,619 " 1.80 m. and above, or 0.86 per cent.

The fact that the unit of measure was borrowed in the first place from the stature of man shows in itself that its variations are limited; later the measure was taken from a part of the circumference of the earth.

However, these variations are important; thus, in Belgium the regular militia measuring 1.80 m. and over were in the following proportion:

1842–1850	0.86	per cent.
In 1888	0.70	"
1890	0.92	"
1895	0.96	"
1899	0.99	"
1900	0.90	"

In France, according to Bertillon, there are, from the point of view of stature, two fairly distinct regions separated by a line which extends from Cherbourg to Lake Geneva. To the north of this line the average stature has risen, varying between 1.67 m. and 1.64 m. To the south it is equal to or below the average (1.64 m.). In two provinces of Brittany and in three provinces of the center it falls to 1.62 m. and even 1.61 m. Broca explains

[1] *Anthropométrie*, p. 187.

the difference in stature of these two regions by their ethnic origin. It is, however, certain that other causes exercise an influence. The study of recruiting in Sweden and the Netherlands shows that in these two countries the stature has risen considerably under the influence of prosperity. In Savoy the study of recruiting by occupations (1852–54) has shown that manual laborers, especially those least remunerated, are inferior in stature to those of the liberal professions.

The Italian Bureau of Statistics published, in 1878 and 1882, two reports of the basis of the methods of averages of Quetelet. According to this method, the simple arithmetical average is insufficient. It is necessary to make a series of observations in order to see how many in each 1,000 men belong to each group of statures. If the population studied is homogeneous, the most numerous groups will approach nearest to the average, which represents the normal type of the population. In northeastern France, where he recognizes two distinct types, in the same way as we have seen that there are two types for the whole of France, the purely ethnic explanation seems equally incomplete, and Bertillon adds: "It is not impossible that the coexistence of these two types may be due to the coexistence of two unequally fortunate populations, the one being relatively rich and healthy, the other poor and unhealthy." Perhaps, indeed, these causes are historically mixed and have combined in the production of the observed result.

In Italy the Venetians and Tuscans showed the greatest proportion of high statures; the Calabrians, the Sardinians, and the Basilicatians, the smallest proportion. Race and physical environment certainly are influential, as is shown in Italy, by the differences of stature in the regions where the economic and social conditions are identical. But the social conditions are none the less important. According to my theory, the ethnical and Mesological factors are also social. The Italian *enquête* which was taken in regard to the stature in the different occupations is decisive.[1]

In a memoir of the highest interest, published in the *Bulletin*

[1] See *Bulletin de l'Institut international de statistique*, Vol. VII, Part II, pp. 273 ff.

de l'Institut international de statistique[1] Mr. Ch. Roberts concludes that the result of twenty years of anthropometrical researches prove that physical differences depend upon (*a*) race and nationality, (*b*) sex, (*c*) social conditions. In the first table he shows that the difference between the highest and lowest averages of statures in thirty-seven different populations is only 25 centimeters. In a second table, relative to the stature of children from eleven to twelve years, he shows in 2,862 observations that the average stature in England diminishes according as they are found in more or less favorable conditions of growth. While the average stature of children in the public schools of the country is 55.5 inches, this stature decreases in the middle-class schools, still more in the elementary schools of the country and in those of the artisans in the towns; again, in the factories and workshops of the country and in the towns; and it falls to the lowest level in the military asylums, and especially in the industrial schools, the average in the latter being only about 50 inches. The third table shows the relative average stature of adults from twenty to thirty years of age, in the different social conditions of life. While the general average for the population of all classes is about 67.5 inches, this average falls, for example, to 65.92 inches in the sedentary occupations in the factories; and among the tailors it almost equal to that of the sedentary of all classes, which is about 66.16 inches, and scarcely superior to that of the defectives of all classes, 65.65 inches.

A diagram giving the different curves of growth of Belgian and English males shows at every age that the curve is higher for the latter. The difference is greatest between 17 and 18 years. For women the curve of growth is a little inferior to that of men in England up to 12 years; it then exceeds it from 12 to 14, and becomes more and more inferior up to 24. The stature of the children of English soldiers is inferior to that of children in general from 6 to 16 years (diagram 3). According to a table with reference to Australia, drawn up by Dr. F. Norton Manning, girls from 8 to 15 years of age are inferior in stature to boys of the same age, but with very small differences;

[1] Vol. VI, Part I (1892), pp. 13 ff.

from which one can conclude that the conditions of life in Australia are favorable to an equal physical development of the two sexes. A very interesting anthopometric study on the influence of gymnastic training of the American women upon weight and stature proves from all evidence that in both relations the limits of variation are much extended, and that in certain conditions woman is equal to, if she does not excel, those of the average European man.[1] The law seems to be that in proportion as the human species is differentiated from the inferior types by the disappearance of the superior anthropoids and the inferior varieties proper, the type of stature has tended to become fixed and uniform within narrower limits. Moreover, as is shown by Darwin, the widely distributed species are more variable than those comprised within narrow limits. This is the case with the human species, only civilization tends to restrain these limits, while multiplying the number of variations.

3. *Muscular force.*— Animals are distinguished from vegetables chiefly by the development of organs of movement and sensibility. In the human species these functions are developed to a very high degree. Although, from the point of view of muscles, man is inferior to a large number of animals, yet it is necessary to take into consideration that muscular force does not depend solely upon the volume of the muscles, but also upon their quality. The human species, thanks to the progress of knowledge, is able to extend artificially its motor power in a degree to which the limits are not determinable. Here, in the same way as for psychical and finally social activity, is the characteristic sign of humanity. One will observe, moreover, that muscular force and sensibility are the fundamental functions of the relations in life. The variations of muscular force are not solely determined by the environment and by race, but also by education to which the muscles are susceptible.

From the first researches begun by Péron with the dynamometer of Régnier, followed up with the same instrument by Quoy and Gaymard, as well as by the expedition of Novarra, we give

[1] C. J. ENBUSKE, in *Bulletin international de statistique*, Vol. VIII, Part II (1895), pp. 292.

the following results obtained from adult males of the same race, based upon the power of the hands:

Péron and Quoy, 80 English	66.2 kg.
——— 122 French	58.1
Quoy and Gaymard, 14 Portuguese	54.6
Quoy and Gaymard, 18 Sandwich Islanders	58.3
Péron and Quoy, 74 Timorians	57.7
Quoy and Gaymard, 17 Carolinians	54.2
Péron, 12 Tasmanians	50.6
Péron and Quoy, 47 Australians	49.2
Novarra, 34 Nicobarese	48.4
Péron, Quoy, and Novarra, 52 Chinese	45.9
Novarra, 9 Japanese	44.2[1]

M. A. Thomson, in weight-lifting, in New Zealand showed that 31 natives lifted 166 kg., two hands; 31 English, 191 kg. It should be noted that the English were almost all soldiers or marines, that is to say, selected men, receiving normal rations. In general, the functional development of every organ depends upon the use made of it and its education; this law dominates the purely anthropological condition.

Mr. Ch. Roberts, in the memoir already cited, gives in a diagram curves of weight and muscular force of the two sexes in England. Weight corresponds in direction to that of stature. Up to twelve years of age the curve is smaller for females, then up to the age of sixteen it exceeds that of males, and from that time it becomes more and more inferior to that of males. The muscular force of females from twelve to fifty years of age is always inferior to that of males. The maximum is reached for both at about the age of twenty-eight.

Muscular force also is limited if one considers it in itself. Socially it may be greatly increased, the variations being very large. According to Quetelet and Hutchinson, there is no doubt that there are also variations in the circulation of the blood, the heart-beats, respiration, and voice, according to sex, race, age, etc. However, these variations are always contained within certain limits, whence results their internal and external equilibration.

[1] TOPINARD, *Anthropologie*, pp. 424–6.

From the tables given above relative to the weight, stature, and muscular force of the human body, the conclusion in general is that the most civilized peoples excel the inferior, and in the same way the upper classes excel those less favored. These results seem to be confirmed by other observations. Poor food and residence in cities, especially if these two conditions are combined, can be considered as factors producing disadvantageous variation. Thus Dr. Francis Galton has taken the stature and weight of 805 children, fourteen years of age, attending the public schools, of whom 509 were reared in London and 296 in the country. In stature the latter were 3 cm. more than the former, and in weight 3 kg.

Concerning the muscular system, although it may be excessively variable, since in a group of 36 subjects Wood was able to show 558 modifications, counting only those found on both sides of the body, it is none the less certain that these variations are limited in the human species by the most general conditions of its existence.

4. *Psychical force.*—Before taking up the natural limits of psychical functions, we may give some data relative to the form, capacity, and size of the principal organ of thought. There is information of great precision as to the facial and cerebral angles, the curvature of the skull, and the weight of the brain. According to Broca and Topinard, the most divergent facial angles in the human species are:

Lower Bretons - -	720	Difference
Namaquian negroes - -	560	16

The maximum differences are connected by gradual and imperceptible transitions. On the contrary, between the Namquian negro and the male chimpanzee the difference is from 56° to 38°, or a difference of 18° *without transition.*

It is the same for the relation of the skull to the face. The relation is:

Lower Bretons - - - - -	4 : 1
Namaquian - - - - - -	4 : 1.25
Chimpanzee - - - - -	3 : 1

Between the lower Briton and the Namquian there are

transitions represented in the most diverse degrees by the different varieties of the human population, while between the Namquian and the chimpanzee the difference is absolute and abrupt.

The cerebral angle gives indications of like significance:

Lower Bretons	159°
Namaquian	152°
Chimpanzee	116°

Between the two there is a series of transitions. Between the highest human development and the lowest development in monkeys there is a marked discontinuity. The cubage of the cranial capacity varies from 1,600 to about 1,200 c.c. in the human species, falling rapidly to 439 c.c. in the orang-outang, and to 421 c.c. in the chimpanzee. There is no *actual* transition between man and the anthropoid apes, at least in the analogous varieties.

Broca has observed that the average cranial capacity of the Parisians of the twelfth century is inferior to that of the nineteenth century; that the skulls of the nobility of the first epoch are larger than those of the plebeians of the same epoch; that the skulls of the attendants in the hospitals are smaller than those of the students of medicine and pharmacy; that the skulls of the factory workers at Clichy (the work being almost automatic) are smaller than those of carpenters and joiners; that the cranial capacity of males is generally much larger than that of females; etc., etc. Despite this large secondary variability, the extreme oscillations average only about 300 c.c. in the entire human species, and these tend to be reduced as the inferior varieties become extinct or civilized; at the same time, the organ certainly loses its plasticity in the superior varieties as it is perfected and as heredity fixes its structure.

The classification of the following populations can, therefore, be made from the point of view of the average cranial capacity. The cranial capacity of the Pithecanthropus of Java, 900–1,000 c.c., is an intermediary form between the gibbons and the most inferior human race known, the Neanderthal (Mortillet):

Prehistoric skulls of Canstadt	1,200 c.c.
Peruvians	1,234
Oceanic negroes	1,234
Nubians	1,324
Mexicans	1,339
Australians	1,339
Negroes of western Africa	1,347
Lapps	1,440
Tasmanians	1,452
Kanackas	1,470
Irish	1,472
Inhabitants of modern Brussels	1,490
Dutch	1,496
Swedes	1,500
Eskimos	1,539
Guanches	1,554
Modern Parisians	1,558
Basques and Auvergnats	1,598

According to Bertillon, the cubage of the Lapps is explained by the abundance of gross marrow and the small quantity of gray cells. The same is probably true for the Eskimos. It is necessary also to take account of the numerical insufficiency of the measures taken. An exact and complete hierarchical classification based upon such simple data can no longer be satisfactory. It ought to take account, not only of those factors which we have indicated above, but also of other, more qualitative factors, such as the complexity of the cerebral convolutions, the proportion of gray matter, the development of the superior centers, etc.

In this connection it is interesting to note the weight of the brain in relation to the cranial capacity with regard to race and sex:[1]

	Male	Female
English and Scotch	1,427	1,260
French	1,334	1,210
German	1,382	1,209–1,244
Austrians	1,342	1,160
Negroes of Africa	1,238–1,316	1,067–1,232
One negro of the Cape	974	
One Australian		907
One Bushman		872
The gorilla (Huxley and Topinard)	475–567	
The brain of Cuvier	1,830	

[1] TOPINARD, *Anthropologie*, pp. 336, 337.

The average for the age of thirty to forty in the white race, when the brain has reached maturity, is, according to Wagner, 1,410 g. for men and 1,262 for women; according to Huschke, it is 1,424 and 1,272, or a difference of 150 g., while the difference between Austrian and English males is 85 g. However, the cranial capacity and weight of the brain do not have an absolute value. The brain of the elephant may reach 3,000 g.; that of the porpoise is the same. The quality is more important. The facial and cerebral angles, the cerebral material, and the nature of the convolutions are elements affording a more characteristic value; they reflect the structure more exactly, the more or less complete equilibration of the external world, and the social environment. Besides, the individual variations of the weight of the brain depend, not only upon race, but also upon age, sex, stature, severe illness, and degree of intelligence. According to Perchappe and Topinard, the approximate percentage in the variations of the total weight of the brain is determined by each of these factors in the following proportions:

Sex	10 per cent.
Age	4 "
Stature	4 "
Mental disease	4–5 "
Idiocy	18 "
Severe illness	10 "
Intelligence	20 "

As this is in close relation to social statics and dynamics, it shows that the exercise of the intellectual faculties together with the increasing division of labor and of functions, has broken up, more and more, the primitive equality of capacity and weight of the brain between the sexes. The average difference is only about 10 per cent. But among the African negroes this difference is much decreased, the relation of male to female being 1,238: 1,232. Since intellectual development can produce a difference of 20 per cent., the possibility of woman gradually overcoming the difference between her and man no longer seems an insurmountable difficulty, on the condition that the reduction of this difference may be in correlation with social evolution; the latter is a condition *sine qua non*.

5. *Cephalic index.*—The index is the relation of two opposite diameters. Thus to get the cephalic index one measures the maximum anterior-posterior diameter, then the transverse diameter, according to the centesimal relation conforming to the proportion of Broca :

$$\frac{D \text{ transverse maximum}}{D \text{ ant.-post. maximum}} = \frac{x}{100}$$

or

$$\frac{D \text{ transverse maximum} \times 100}{D \text{ ant.-post maximum}} = x \text{ or cephalic index.}$$

The cephalic index gives, for the extreme limits, two human anatomical varieties, represented by the dolichocephalic and the brachycephalic types.

The classification resulting from this seems to indicate that the highest civilizations do not belong to the peoples having the extreme types of cephalic index, but rather to mixed types produced by selection and fusion. Also, almost all civilizations, and especially the highest, do not present homogeneous but rather very heterogeneous types. The latter is an important statement for sociology—a statement of a nature to reduce much of the importance attributed to race. This law is in accord with that announced earlier, that is, that the species having the widest distribution are more variable than those confined within narrow limits (Darwin). The human cephalic variations in this respect are as variable as the muscular variations. Nevertheless these variations can be considered as relatively secondary to the numerous bodily and mental resemblances among the most distinct human races, which, moreover, are themselves more or less mixed.

I. DOLICHOCEPHALIC TYPE — INDEX BELOW 75.

Australians	71.49
Eskimos	71.71 to 73
New Caledonians	71.78
People of Canstadt	72
Hottentots and Bushmen	72.42
Botocudos	73
Negroes of western Africa	73.40
Arabs	74
Kabyles	74.04

II. TYPE SUB-DOLICHOCEPHALIC—INDEX ABOVE 75 AND UP TO 77.77.

Ancient Egyptians	75.58
Polynesians	76.36
Spanish Basques	77.62
Fifty-four skulls of Stone Age	75.01
Gauls (Iron Age)	76.93
Guanches	75.73
Inhabitants of Brussels, twelfth to sixteenth century	75 +
Flemings from Limburg	76.75
Anversois	77.17

III. MESOCEPHALIC TYPE—INDEX ABOVE 77.77 UP TO 80.

Inhabitants of modern Brussels	77.27
51 East Flemings	77.90
59 Normans of seventeenth century	78
79 Dutch	78.89
27 Slavs (Koperniski)	78.90
51 West Flemings	78.91
61 Walloons (Hainaut)	79.15
76 North Americans	79.25
384 Parisians	79.45
16 Skulls of Orrony (Polished Stone)	79.50

IV. SUB-BRACHYCEPHALIC TYPE—INDEX ABOVE 80 AND UP TO 83.33.

Javanese	81
80 Walloons	81
26 Belgian Luxemburgers	81.17
Mongols	81.40
Turks	81.49
Lower Bretons	82.
299,355 Italians (of all regions)	82.7
Alsatians and Lorrainians	82.93
100 South Germans	83

V. BRACHYCEPHALIC TYPE—INDEX ABOVE 83.33 AND UP TO 87.

Indo-Chinese	83.51
Finns	83.69
Savoyards	83.63 to 85
Servians and Croatians	84.04
Auvergnats	84.07
Lapps	85.07
Skull of Lelaigneaux	86.91

The comparison between the human species and the anthropoid apes, in this respect, shows that the differences are so great,

that we can conclude after considering all which precedes, and neglecting other relations, that man constitutes a species distinct from the anthropoid apes, laying aside all questions of origin and descent. Man is superior to the anthropoid apes in the proportion of the parts of the body, in the size of the cranial cavity, in weight, in the convolutions of the brain, in quantity of gray matter, and in structure, mass, and quality of thinking material. This superiority is manifested in a palpable manner by definite characteristics excluding all real confusion between the anthropoid apes and man. Man forms a distinct species by reason of appropriate variations and by digression of these from the maximum limits, from the variations of inferior beings. In return the sense cavities are more developed among animals, the orbits, nasal cavities, sinus, masticating apparatus. Although inferior from the muscular point of view, to many animals, man is capable of more complex movements; from the point of view of sensibility and intelligence, he surpasses all. If, anatomically, the anthropoid apes are still nearer man than they are to the ordinary monkeys, for example, from the point of view of the cranial capacity and weight of the brain, there is nevertheless between them and the inferior varieties of humanity a considerable difference of which the intermediary stages have disappeared and nothing has come forth to supply them. Moreover, this difference from the anthropoid apes makes man's progress more rapid. There results a differentiation co-ordinating the skeleton, muscles, viscera, and eyes. This gives man the power of scientific observation, of prevision, and foresight.

The difference between the two species tends to become greater in proportion as the inferior populations disappear, whether by extinction or by fusion with civilization, and, on the other side, as the anthropoids themselves become eliminated.

On the whole, there is a general type, clearly determined and limited, common to all the mammalia; a particular type common to all the primates, comprising the monkey, anthropoid ape, and man; a more special type common to the anthropoid apes and to man; and, finally, a human type anatomically and physiologically determinate and recognizable. This human

structural type is capable of more complex and numerous equilibrations and adaptations than any other mass of inorganic or organic matter of nature. Its motility and thought extend beyond the limits of the earth. This is especially true when we view it not simply as individual, but also in its proper *milieu*, the social, where it takes on its integral aspect of individual-social existence. Then the muscles and brain co-operate in collective efforts of incomparable extent, duration, intensity, and equilibrium.

6. *Centers of association.*— Psychology, at the end of the nineteenth century, has been changed by the application of the experimental method and by a more exact knowledge of the nature of the nervous system. The school of Wundt for method, the works of Ramon y Cajal and Flechsig for the nervous system, have completed the basis of sociology in facilitating, by analogy, the conception of social statics and dynamics. The discoveries of Ramon y Cajal have shown that a nervous structure of which the elements are discontinuous can, however, exercise a continuous action; those of Flechsig, that the association of ideas, generalization, and abstraction have their parallels in the nervous system, and that consequently the philosophical power of the human species, that by which it is distinguished from all other forms, also has its material and physical foundation. This conception is destined to give us a better comprehension of the fact that all social phenomena are at the same time inorganic, organic, and psychic, and that our faculties of perception, generalization, and abstraction find their basis in the substance and organization of the nervous system through which all ideology is connected to inorganic nature through the mediation of organized substance.

After a quarter of a century of patient research, Flechsig, professor of psychiatry at Leipzig, has established the order of appearance of myeline in the nerve fibers by a comparison of the brain of embryos, of the fœtus, and of infants. It results from this that if, at the beginning of the average brain, the resemblance between the nervous system of man and that of the mammalia is considerable, there is no resemblance in the cerebral

membrane, which shows a considerably different development in man, where the zones of association are the centers of intellectual functions.

The essential point of the theory of Flechsig is that, contrary to what was accepted, all the zones of the cerebral cortex are not connected by bundles of fibers to the lower part of the gray matter. The cerebral cortex is divided into (*a*) zones or centers of projection, or sensorial spheres, and (*b*) zones of the membrane, comprising all the parts of the latter with exception of those connected with the fibers of projection, but connected by numerous fibers of association to the sensorial spheres and to one another. The centers of projection are both sensitive and motor. Their extent or limits are determined by the number of fibers they receive and send out in proportion to their surface. There are three zones of association: (1) the large posterior center of association, comprising a part of the lingual convolution, the fusiform convolution, the two parietal convolutions, the lower temporal and anterior part of the occipital lobe ; (2) the middle center of association, comprising the *insula de Reil;* (3) the anterior center of association, formed by the anterior part of all the frontal convolutions and then by the convolutions on the orbital surface.

In comparing the results of the researches of Flechsig, it is shown that the zones of association in man correspond to two-thirds of the cortical surface, and the zones of projection to only one-third. As one descends the animal scale, one sees that in the monkey the proportion is the same for each of the parts; then in the mammalia the zones of association diminish more and more until the zones of projection exist almost alone.

The essential character of the zones of association is in not having a direct connection with the lower gray masses that is, in being independent. No impression from the periphery reaches them without the mediation of the centers of projection, and no imitation can emanate from the zones of association without passing by those of projection.

The centers of association receive impressions by the sensorial spheres, focus and compare them, and form the substratum

of our experience, of our science and philosophy. They hold the zones of projection under their control, exercising on them an inhibitory or stimulating action from the point of view of our acts. To them alone belong conscious and especially methodical action.

The large posterior center of association plays perhaps the most important rôle. It is highly developed among intelligent men, but small among defectives. It may be noted that it is inserted between three of the most important sources of impressions: the tactile, auditory, and visual zones. On the contrary, the middle center, *insula de Reil*, is only between the tactile and olfactory sphere. The most scientific and precise impressions are then in relation with the former.

Thus in the constitution and evolution of the human nerve substance we have the substratum of intellectual development. In the prosencephalon the sensitive centripetal fibers are the first to develop the myelines and function. They appear at about the eighth month of the intra-uterine life. When these sensitive fibers have appeared, then the sensations stimulate the centers, and the myeline appears in the fibers of centrifugal projection toward the end of the first month of the extra-uterine life. At this period only the centers of projection have developed the myeline and become active; the acts of the child are still cortical reflexes; the memory of impressions is not yet fixed in the brain. The latter from this point of view resembles animals without centers of association. All the impressions are received singly and are not compared. In the second month the myeline fibers appear and start from the sensorial spheres, going to the zones of association, and at first to the neighboring parts of the zones of projection. Then the memory of impressions is stored up. The child begins to recognize what it feels, sees, etc. Then the fibers of association, penetrating still farther, connect certain different spheres; for example, the auditory sphere with the lower part of the tactile sphere; the child is able to repeat the words heard, without comprehending their meaning. Finally, all the spheres of association being connected, the images can be compared. The child will reason, comprehend,

recall. Still the development of the myeline continues for a long time, perhaps the whole of life, with the practitioner, the *savant*, the philosopher. The intellectual centers become more and more specialized according to work, original aptitude, etc. Conversely, in cases of general paralysis the superficial fibers of association disappear first.

We see a vast field opened by this theory to psychology, and consequently to philosophy in general, and particularly to the philosophy of society. In every case, the result seems to be that the true distinction between the human species and the lower forms resides especially in the development of the associative centers; the latter are the characteristic marks of the human species. Perhaps some time evolution, verified in the relation of animals and of the child to the adult man, can be extended to different populations and can without too much boldness maintain the hypothesis that ontogeny reproduces phylogeny. In such case one could proceed to a really positive classification of the varieties of the human species. That which precedes shows us, however, that the latter is fitted by its nervous organization to realize forms of adaptation and equilibration superior to all the other forms which we have considered. These more special, complex and, at the same time, co-ordinated forms are connected, nevertheless, with the whole of inorganic nature itself and prepare us for a clear comprehension of the diverse social equilibriums.

SECTION VII. PSYCHICAL LIMITS.

From all our preceding observations it follows that all the natural phenomena, without exception, are subjected to conditions and laws which determine their structure. We have recognized these limits of variation, this equilibration, in the nervous system, and especially in its central and superior organ, the brain, when the most complex equilibration of all takes place—that which results in the formation of centers of association which serve as the basis for the highest specialization represented by scientific knowledge, generalization, philosophical, and sociological abstraction. Let us now look at the psychical function itself and investigate whether in this class of phenomena, the

most directly connected with social phenomena, we, as is assumed, meet with the constitutive factors of this notion of limits and boundaries which is the most simple and general expression of the differentiation of all bodies and their equilibrium.

First of all, our knowledge is limited; memory depends upon the brain; the latter has only a definite number, though enormous, of nervous elements, cells, and fibers; thence the constant limitation, though relatively variable, of our acquisition. The gray matter which covers the cerebral hemispheres forms a surface, an inclosed field, of about nineteen square decimeters and an average thickness of two and a half millimeters; this layer can contain about 1,200 million cells and 4,800 million fibers.

Each branch of knowledge, as mathematics, language, music, etc., is necessarily limited by the presence and coexistence of others; despite their common lines, each cerebral localization is naturally limited by its neighbors. Locke, the founder of modern psychology, knew that first of all it was necessary to determine the limits of the human mind. He investigated the origin of our ideas and thus prepared the way for a natural history of their development. He applied the comparative method to this science, studying the intelligence of children and savages; these studies were extended to animal intelligence. The way opened was good, and it finally led to the use of the experimental method from the time when the latter was used in physiology, thus making possible an exact science of psychology.

The material collected permits us now to affirm, with Huxley, that whatever may be the system of organs considered, the comparative study of the modifications in the serial order of the primates leads to the conclusion that the anatomical differences separating man from the gorilla and the chimpanzee are smaller than the differences between the latter and the higher monkeys. From our observations of cerebral anatomy we can say that the primitive peoples are connected with the highest civilized peoples through intermediating varieties by imperceptible transitions, while between the most primitive peoples and the highest simian varieties the difference is enormous and abrupt, with a tendency to an increase of this difference either by the continuous disap-

pearance of the lower human types, by the development of the latter, or by their extinction and by the extinction of the higher simian varieties. If the observation of Agassiz remains in part true, that one cannot see the distinction between the intelligence of a small child and that of a young chimpanzee, we have seen, nevertheless, that, notably in the development of the centers of association, their brains are quite distinct and are differentiated at the departure from the uterine life. The development of the chimpanzee is arrested early, while the child is cerebrally organized by selection and heredity for a career incomparably longer. However, among men the intellectual capacity varies. Primitive peoples cannot count beyond 2, 3, or 5, then follows for them the infinite and unknown. For the superior varieties of the human species these limits are extended; yet the law of limitation remains constant. Our potential psychical ability is limited, just as our muscular force. In his *Système social et des lois qui le regissent*, as well as his *Anthropométrie*, Quetelet has tried to extend the process of measurement of the exact sciences to intellectual phenomena. Contemporary experimental psychology would be unjust in not recognizing these efforts despite their imperfection natural to the epoch in which they were produced.

The tendency to intellectual uniformity is nevertheless continually realized by the disappearance of the less intelligent societies and in each society by the continuous elimination of the less intelligent, or indeed by the development of inferior societies, classes, and individuals. This tendency toward reduction of differences between intellectual attainments and between civilizations proves in itself that the variations of our intellect are limited. Differences exist, indeed, in relation to certain anatomical conditions of the brain and to correlative sociological conditions, but the resemblances between civilized and savage peoples are fundamental and constitute the rule to which progress only limits the exceptions.

Certain linguists have arrived at the conclusion that there is a determinate number of irreducible languages corresponding to isolated and primitive races. These languages also require a particular structure of the throat and vocal organs. The latter

are equally related to the physical environment. These languages also require special training for understanding them, yet these differences, as much morphological as intellectual, are of simple particularities which do not destroy the general anatomical structure nor the fundamental structure, common and universal in intelligence. Also, the laws of the formation and evolution of languages seem necessarily uniform, despite their variations and limited oscillations. What is harmony from the point of view of the musical scale for the auditory nerves of certain races is not for others. But these differences are not absolute; there are laws of the harmony of sounds, then of natural limits, statics, in a word, of all the particular dissonances.

The main point is that the *cercle de la conscience*, as Ribot says, the *Umfang des Bewusstseins*, as the Germans say, remains always a limited circle. Limitation is a constant and necessary condition, a law of thought.

Let us consider magnitudes. I think of a measure, say a meter or centimeter. As I have each idea in turn somewhat well defined, I thereby have a somewhat definite idea of their relation. On the other hand, our capacity to think relations becomes partly ineffective when one of the terms is undefined. In that case the relation eludes representation. This is the basis of the theory of the unknowable—a theory, moreover, as I have elsewhere pointed out, which is false in the absolute sense. In a word, even in this case the relation, which is nothing but a quasi-empty form, still retains a certain quality. If the quantitative measure is not possible, there remains a general qualitative appreciation, vague in its character, of extension, of duration, and of force. But if even this purely qualitative representation of one of the terms of the relationship can no longer be presented to consciousness, there is no longer a relationship, and consequently no knowledge; that is, we can appreciate phenomena in correlation with each other and not otherwise. The law of thought is that it is not able to pass the frontiers of the relative.

"When we try," says Herbert Spencer,[1] "to go beyond the

[1] *Essays Scientific, Political, and Speculative.*

phenomenal manifestations of final reality into this reality, we find it necessary to express it by the aid of symbols which the phenomena furnish us."

But under these conditions the error of Spencer and of all the agnostics has been precisely that of attempting to fix the limits of the known and the unknown, and of specifying absolutely what should be assumed to be unknowable.[1]

Generally, all our sensations are derived from the senses, and through these all our ideas, all our concepts. It follows that all the properties of bodies are known to us as necessarily limited and conditioned as they are in reality. The same is true of the perceptions registered by the special organs of sense which contribute to the formation of our knowledge. The associations of ideas and feelings, also, conform to this same law of limitation which also dominates our largest generalizations and our highest abstractions. Space, time, movement, matter, whether in their largest or smallest dimensions, are inaccessible to our intelligence. We do not know them scientifically except as limited, and they are not otherwise in reality. Our capacity of knowing is a relative capacity to the subject and the object, a limited capacity. Space signifies only the difference of the situation of bodies. Time is their difference of succession. Matter is their difference of combination. Movement is the variety of changes which occur among them. We cannot form an idea of any portion of space or of time without thinking of space and time which is exterior to the same in the case of space and anterior or posterior in the case of time. Time itself serves as the measure of space and space as a measure of time. Space and time, at once finite and infinite, are therefore necessary conditions of our observations and of all our knowledge.

The only limits, finite or infinite, which we can assign to time, space, matter, or force are those of our sensibilities and of our perceptions. Experience parallel with the development of our organs and of our sensibility, has permitted us with the

[1] On the theory of the unknowable see the two chapters devoted by M. A. FOUILLET to the objective and the subjective limits of science, pp. 3–28 in his book, *Le mouvement idealiste;* also my study of *L'inconnaissance dans problèmes de philosophie positive;* Paris: Schleicher frères, 1900.

progress of civilization to extend the domain of our knowledge in the direction both of the finite and of the infinite; but always by an equilibration which each exerts upon the other. Astronomy, with its telescopes, chemical and spectral analysis and microscopy, unveils to us more and more the excessively great and the excessively small, but we always encounter limits; that is, the necessity of recognizing bounds of our knowledge, our feelings, and our acts, as well as our abstract notions of space, time, matter, and force. The notion of the infinite, or rather of the indefinite, holds us, therefore, to the constant necessity of the finite, or rather of the conditioned and relative. Our nervous centers themselves are the co-ordinators, the regulators of the functioning of our muscular movements and of our psychical activity. They impose upon them rule, measure, unity. A conception which seems to make us independent of these is thus a perturbation of the nervous centers in their relation to the organs which govern our contact with the environment.

The sense of resistance is the primordial element of consciousness. It is universal and always present. It is manifested by time, space, matter, or force. Even organisms of the lowest order, such as the zoöphyte without nerves, prove this. It is the first impression of the child even before birth. Every animal shows this by the fact that, even if unprovided with special organs, the parts of the body manifest sensation. It is resistance which in the most simple and most general manner suggests to us the notion of relationship, that is to say, of a resemblance or difference between the subject who feels or observes and the objects felt or observed. Accordingly it has been well said that resistance is the woof of the thought which we are always weaving.

In reality every state of consciousness may therefore be reduced to a mechanical action and reaction. The simple muscular sensation is thus the primary, most general sensation. The special senses are developed chronologically after this first sensation for more particular adaptations and adjustments. This muscular sensation is the primary basis of consciousness. In a word, sensation is a resistance from the time that it is trans-

mitted to the formative centers of consciousness and transforms itself into a perception, that is to say, in the establishment of a relationship of coexistence between the muscular sensation itself and that particular state of consciousness which we call volition. In the act of perception this relationship is classified with relationships previously known. This classification once affected, the subject gains more and more, in proportion to the frequency of his experiences and perceptions, special knowledge of muscular combinations of adjustments, and of the degree of energy to be used in each situation where his will is put in motion for the sake of realizing an adaptation. Thus psychism in general runs back to the primal laws of movement which govern matter and force in time and in space. General philosophy receives a monistic interpretation which extends, as we shall see, to social phenomena.

SECTION VIII. RELATIONS AND LIMITS OF PSYCHO-PHYSIOLOGY AND OF SOCIAL PSYCHOLOGY.

The collective life of societies is subjected to laws, not absolutely identical to those of animals, but in part analogous. The first consciousness of a collective life in a society arises through the impression of external resistances from other societies or from physical obstacles impeding its activity and its movements. The reiterated experience of these resistances gradually brings societies to the consciousness that their structure and activity are limited. It teaches them that they must adjust their institutions and actions to external and internal conditions; that is to say, to equilibrate their forms and movements according to the most exact relations possible. Here is one of the primordial psychical origins of the theory of limits. The collective consciousness becomes more or less clear as the voluntary activity of the whole society is limited by the physical and social forces of the environment. Thus the consciousness of that which resists is, either from the individual or social point of view, the point of departure of the consciousness of existence, whether individual or distinctly social, but dependent precisely because distinct. Among individuals this consciousness arises from the intra-uterine life, from muscular tension, and subsequently from pressure exercised in

a part of the body, or in the entire body which resists. In societies it arises from extensive experiences of the group, from pressure exercised in consequence of, and inevitably upon other societies, or even from simple physical obstacles forming a resistance. In relation to this primordial consciousness, it is necessary to attribute the highest importance to two functions: the preservation of the individual and of the species. Every other function is subordinate to these. Each of these functions determines whether the habits of the individual will be solitary or social, or partly solitary and partly social. Sociability can begin to assert itself only when there is produced among the individuals a stronger tendency to co-operate by means of the first favorable variation in the structure and activity through the impression and perception of an external physical and social resistance. This tendency will be increased by the survival of the better-endowed persons and groups, whose actions will be better fitted for the preservation of the species. The strongest and most durable societies will be those which, under these conditions, can best adjust their efforts to their energies, and on the other side resist the external forces. These reciprocal limits are the fundamental psychical factors of the theory of political boundaries. Again, psychical laws, both individual and collective, limit the movements and structure of men and societies, as over against the resistances — the pressure from the outside. Between the pressure and the effort there is established a balance — a limit. Within the societies themselves an analogous phenomenon is accomplished; the *presence* alone of other like individuals in the group produces mental states of sociability by the fact of resistance; that is to say, the limits that one individuality imposes upon another. Individuals are forced to adjust themselves to one another. In a large crowd one is pressed against others and forced to go with the current or remain in one place. From this common life arises a common consciousness. Their origin is undoubtedly due to the sensation and perception of a resistance and of a proportional effort.

Outside the group this perception gives place to the fixation of a boundary; within the group, chiefly to a common effort, to

co-operation, to simultaneous and similar movements, unpremeditated at first, which must not be confounded with imitation, although the latter is partly derived from them. This is the first sociological explanation from the psychical point of view of the phenomena which psychology properly speaking has noted under the designation of sympathetic fears, panics, imitations of actions, gestures, habits, and common pleasures. But it has not led to the more general concept of force and movement. We know also that all these factors of sociability have been rendered still more efficacious by the development of the æsthetic emotions, and especially of the affections which proceed naturally from the relation of the sexes and from the parental relationship, both maternal and paternal. As for imitation, it is explained by the natural collection of individuals and groups which have acquired characteristics advantageous for their preservation and development. In all these cases the consciousness of resistance to the internal or external environment has formed the departure for both individual and collective consciousness. This consciousness, whether obscure or clear, of resistance and effort, gives a collective existence to the first human groups and co-operates with more special and more complex social factors which we will discuss further in the explanation of the philosophy of limits. If, then, limits of some kind, narrow or coincident with our planet itself, are the necessary and constant condition of every social structure, we can assert that besides mathematical, physical, chemical, and biological forces, all of which, as we have seen, are limited, there are also limits among the psychical forces, both individual and social. Social statics is a more special and complex division of universal statics. The latter gives the philosophical explanation and proof of the former.

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[*To be continued.*]